Application No.: 09/914,449 Docket No.: 21900-00034-US

REMARKS

The Office Action and prior art relied upon have been carefully considered. In an effort to expedite the prosecution a clarification is being made to page 14 of the specification in order to avoid further repeated rejection of the claims on non-art issues.

Claims 16 and 17 stand rejected under 35 USC § 112, first paragraph, as failing to comply with the enablement requirement, and Claims 16 and 17 stand rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The following explanation based on the specification is offered in order to clarify the present invention. As set forth on page 2, line 22 — page 3, line 2, bedsore occurs due to the generation of smelling components and harmful components around patient's body due to the patient's lying in bed for an extended period of time. The present invention was made to effectively decompose and eliminate such smelling components and harmful components thereby preventing bedsore. More specifically, according to the present invention such smelling components and harmful components are removed by a deodorant serving as an agent for removing harmful substances. The deodorant is impregnated in a sheet and processed by graft polymerization. The above features of the present invention are clearly mentioned in the specification on page 3, lines 3 — line 16.

The amendment to page 14 of the specification should clarify the Examiner's query as to whether the harmful substances causing bedsore are those listed on page 14, lines 1-5. It should now be clear that the substances causing bedsore are generated by a patient lying in a bed for an extended period of time. The substances listed on page 14, line 1-5 are examples of other types of harmful substances that can be removed by the sheet made by the present invention and this offers an advantage aside from the bedsore issue.

More specifically, the listed substances are usually emitted from building materials of a new home into the air within such new homes (page 10, lines 7—16). Since the sheet according to the present invention removes such harmful substances present in the air

within a new home house, the sheet can be used as a product for removing such harmful substances so as to contribute to the general well being of the new home occupants. The substances listed on page 14 of the specification are presented to show that even such substances, which are believed to be harmful to health, can be removed by the sheet made by the present invention.

Claims 16 and 17 stand rejected under 35 USC § 103(a) as being unpatentable over JP 04289274A (abstract) in view of ELESH (U.S. 4,525,409). However, the disclosure by the JP '274 is totally different from the present invention as follows:

According to JP '274, graft polymerization is performed first and then copper (Cu) is added to the graft polymerized portion of a fabric. Furthermore, deodorant function is achieved by only the copper added on the surface of a fabric where graft polymerization is performed so that copper will adhere to the surface of a fabric uniformly as a thin layer. In other words, graft polymerization performed in the disclosure of JP '274 has nothing to do with deodorant function since such processing is performed so that copper will adhere in an ideal manner.

On the other hand, according to the present invention, graft polymerization is performed after adding deodorant to threads by impregnation as clearly set forth in claim 16. As mentioned on page 10 of the specification, the deodorizing sheet was already developed for the purpose of removing offensive smells in a room or of eliminating harmful substances generated by new types of building materials. The present invention extends the usefulness of the invention to bed-ridden persons by also preventing bedsore.

In order that graft polymerization used in the present invention will be better understood, applicant submits a Japanese document with its English translation. This document, titled "GRAFTON", was made by Bussan Grafton Co., Ltd. which is promoting the new type deodorant materials.

As discussed in the above, since JP '274 does not disclose graft polymerization after impregnation of deodorant, even if the disclosure by ELESH is combined with JP '274. Therefore, the present invention cannot be met by the cited art and It is believed

that the present invention defined by claims 16 and 17 is patentably distinguishable over the prior art.

In view of the above, consideration and allowance are, therefore, respectfully solicited.

In the event the Examiner believes an interview might serve to advance the prosecution of this application in any way, the undersigned attorney is available at the telephone number noted below.

The Director is hereby authorized to charge any fees, or credit any overpayment, associated with this communication, including any extension fees, to CBLH Deposit Account No. 22-0185.

Dated: November 10, 2003

Respectfully submitted,

By _____
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GRAFTON [グラフトン] 技術解説・資料

02/03

物産グラフトン株式会社

[グラフトン]は電子線グラフト重合法を応用した世界特許技術であり、安価に目的物質を分子レベルで化学吸着します。従来、「高機能高コスト」であった電子線グラフト重合の「高機能低コスト」化に成功したグラフトンテクノロジーについて解説します。本技術は横浜国立大学 堀雅宏教授(*1)との共同研究を通じて、ホルムアルデヒドなど VOC、シックハウスの対策技術としても学会等に発表され既に実用化されています。

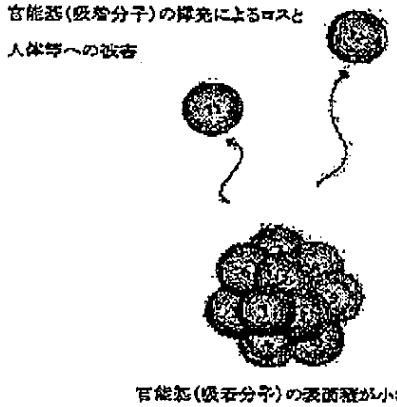
[グラフトン] とは

特許(*2)異なる性質をもった複数の物質を、安価に電子線グラフト重合させる技術とその製品です。

原理 安定した物質である基材(セルロース、樹脂など)と、高い化学反応性により目的物質を吸着する官能基(酸性基、アミノ基など)を化学結合させます。製造方法は、基材を電子線照射により一時的に活性化させ、その活性点に官能基をイソギンチャクの触手のようなテンタクル構造状に接木(グラフト)するものです。

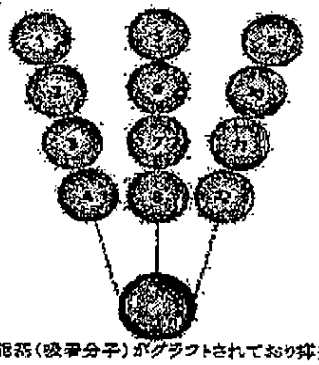
①高速度	目的物質と官能基との直接接触面積が広く吸着速度が高い
②大容量	重量あたりの実効官能基の容量が大きい。NH_3ガス 同重量活性炭の150倍
③逆放出なし	化学反応型吸着のため物理吸着活性炭のような吸着物質の逆放出がない
④長い持続力	官能基が効果を維持したまま基材から離脱しないため持続性が長い
⑤高い安全性	高分子のため安全性が高く、安全な基材・官能基の選択性も広い
⑥広い応用性	液状、粒状、シート、ゲルなどの形状が基材の選定により可能
⑦高い選択性	官能基の選定により、塩基性ガス、酸性ガスなど目的物質の選択が可能
⑧低コスト	特許技術で高機能高コストのグラフト重合製品を高機能低コストで生産可能

分子モデル構造比較 (実際には3次元に展開しています)



従来型化学反応タイプとグラフトンとの比較

従来型	性能項目	グラフトン
×	吸着速度 脱臭時間	○
×	吸着容量 実効官能基数	○
×	脂肪酸 酸性臭力／臭気	○
×	持続力 物質安定性	○
×	有害性 分子量、放散	○



全ての官能基(吸着分子)がグラフトされており脱落しない。
外界に向けて開いている(吸着面積が大きい)。

ホルムアルデヒドガスに対する吸着比較

同重量活性炭に較べ、[グラフトン] は約75倍の吸着容量があります(当社比・4p)。
活性炭・ゼオライトなど物理吸着系のものは、一旦吸着した分子を温度変化等により逆放出します。また選択性もなく、他のガスや水分などを吸着してしまい目的を果たせません。
グラフト重合ではなく、母材に液剤を物理的に含浸させたタイプは、デシケータ等の密閉空間における実験では揮発成分が拡散しないため良い吸着データがでますが、開放された現場では成分が早期に外部に蒸発拡散して目的ガスと反応しないため効果がでません。
光触媒は、効果がないばかりでなく、反応後のガス濃度のほうが増大してしまうことが報告(*3)されています。

主な公的発表・実績 （抜粋）

1. 1993 年 環境技術研究協会 パルプボールを基材とした脱臭材の性能評価（第一報）
2. 1994 年 オンワード樫山 デオドランドスーツに採用 （ドライクリーニング耐久）
3. 2000 年 室内環境学会 「室内環境改善のための壁膜材料性能試験方法の検討」
   ＊ホルムアルデヒドの封じ込めで98％の最高評価 横浜国立大学 堀雅宏教授
4. 2000 年 (財)建築環境・省エネルギー機構 RC造実大実験 38 種ガス体の減少試験
5. 2001 年 住宅供給公社 老人ホームにて施工
6. 2001 年 住宅関連公団 総合研究所技術センターにて施工
7. 2001 年 新幹線のぞみの喫煙車両用エアーフィルターとして採用
8. 2002 年 空気清浄学会、建築学会で研究発表予定
9. 2002 年 米国環境保護局 IAQ (Indoor Air Quality) 学会 世界大会にて共同研究発表予定

化学反応式

1. ホルムアルデヒド（HCHO）やアセトアルデヒドを確実に捕まえて浄化・消臭する化学構造としての官能基が化学結合によりパルプボール（再生セルロース）やデンプンに取り付けられています。化学反応によってホルムアルデヒドやアセトアルデヒドをアルデヒドオキシムと水に変換します。もとに戻ることはありません。

   化学反応式 $R\text{-}SO_3HONH_2+HCHO \rightarrow CH_3NO+H_2O$ （R は基材）

2. アンモニア（NH_3）に代表される塩基性悪臭を捕まえて消臭する化学構造（官能基）である高分子スルホン酸基（$-SO_3H$）が高い密度で（グラフトン1kgあたり1～2モル）化学結合によりパルプボール（再生セルロース）に取り付けられています。次ぎの反応式にしたがって有害物質・悪臭を吸着するので、部屋の温度が上昇しても活性炭のように再び有害物質・悪臭がもとに戻ることはありません。

   化学反応式 $R\text{-}SO_3H+NH_3 \rightarrow R\text{-}SO_3NH_4$ （R は基材）

3. メチルメルカプタン（CH_3SH）や硫化水素（H_2S）などを浄化・消臭します。その他、有機化合物に由来する多くの種類の有機臭に有効です。基材には大きな表面積をもつ多孔性材料である活性炭なども使用し、化学結合により金属錯体などが取り付けられています。次の式に代表される反応が起きます。メチルメルカプタンと硫化水素等は無臭の他の物質に変化し元にもどることはありません。

   触 媒 $R-2N(CH_3)_2CuSO_4$
   $R-2N(CH_3)_2FeSO_4$
   化学反応式 $4CH_3SH+O_2 \rightarrow 2(CH_3)_2S+2H_2O$
   $2H_2S+O_2 \rightarrow 2S+2H_2O$

(*1) 横浜国立大学 堀雅宏教授 現在経済産業省により進められているシックハウス対策用の「JISによる室内空気質の揮発性有機物質（VOC）の測定方法」のワーキンググループの主査。研究多数。

(*2)
Japan	Pat.2643823	吸着材料及びその製造方法
Euro.	Pat.0616845	Adsorptive materials process for producing them
U.S	Pat.5,506,188	Adsorptive materials process for producing them

(*3) 光触媒を利用した化学物質の低減に関する研究(2)
三好、星 「東京都環境科学研究所年報 2000」

主成分

基材	再生パルプ 活性炭 ゼオライト 澱粉還元溶液 レーヨン ナイロン ポリエステル
官能基	カチオン系高分子スルホン酸基 高分子カルボン酸基 アミノ基 金属錯体など (用途に応じ官能基の変更が可能です。)
その他	麦芽還元糖 水分など

利用方法

直接重合	生地や樹脂など製品そのものに電子線照射を行い直接グラフト重合します。 高い官能基濃度が得られ、洗浄しても効果は落ちません。
混合	別の基材にグラフト重合したものを製品に混合します。 繊維や粉体など応用範囲が広く、官能基濃度、コスト計算が容易です。
含浸、塗布	水溶性基材にグラフト重合したものを製品に含浸、塗布します。 既存の生産システムに導入が容易であり低コストです。

用途例

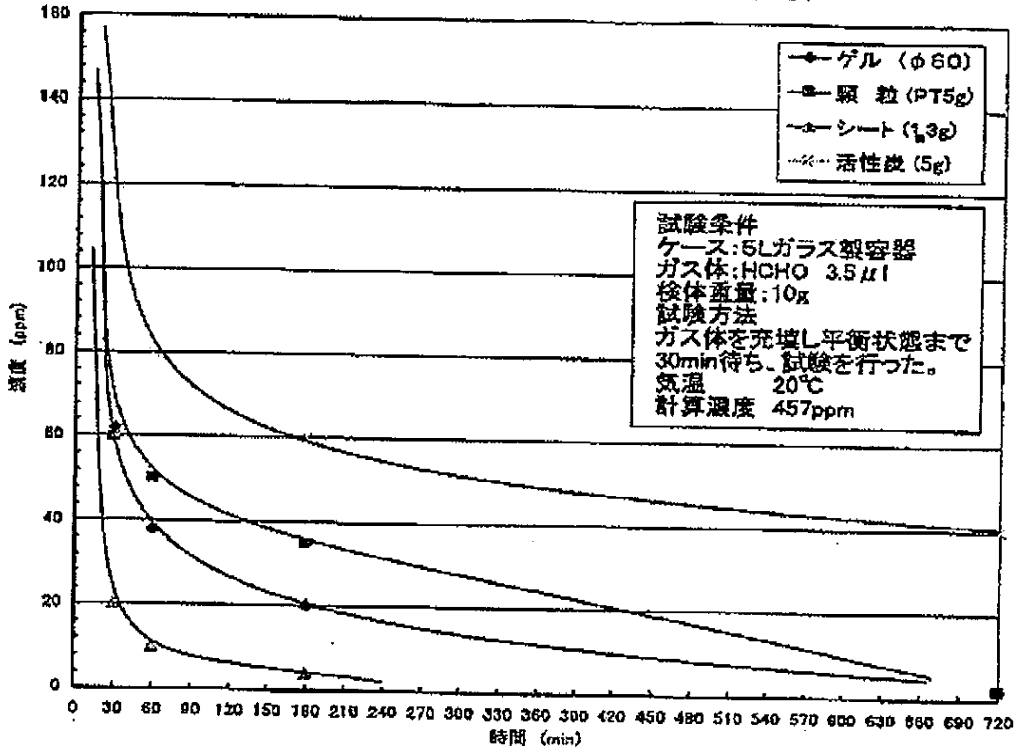
自動車	車内 VOC・消臭対策
溶剤	残留モノマー処理、生産時排気ガス処理
繊維	機能生地、フィルター
フィルター	VOC・消臭、廃液処理
塗料	機能塗料、残留モノマー処理
接着剤	機能接着剤、残留モノマー処理
添加剤	生産時余剰物質処理
化粧品	機能化粧品、保湿
トイレタリー	保湿、消臭
薬品	有害物質吸着除去、他
生ごみ処理機	消臭 (菌床添加材)
ペット用品	ペット臭吸着シート、顆粒、スプレー
建材・インテリア	シックハウス対策
ビル・住宅	シックハウス対策
包装・梱包	機能包装・梱包
一般消臭剤	ゲル、スプレー、他

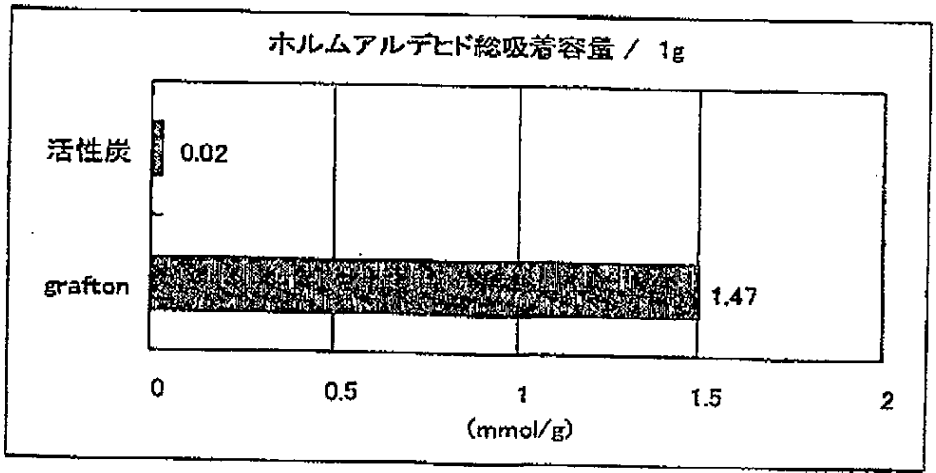
GRAFTON [グラフトン] ホルムアルデヒド吸着試験データ

試験方法 ③

5Lのガラス製容器に HCHO をマイクロシリンジにて 3.5μl 充填し平衡状態まで 30min 待ち、時間経過後の残留濃度を測定した。すべてが気化した場合の濃度は 457ppm である。
検体は GRAFTON[グラフトン] シートST・ゲルGRT・顆粒PT 比較検体:活性炭

ホルムアルデヒド(HCHO) 吸着曲線 静置試験

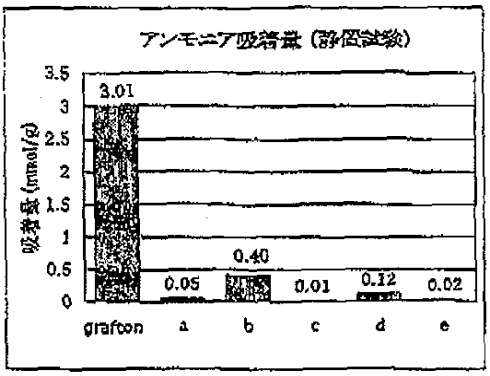


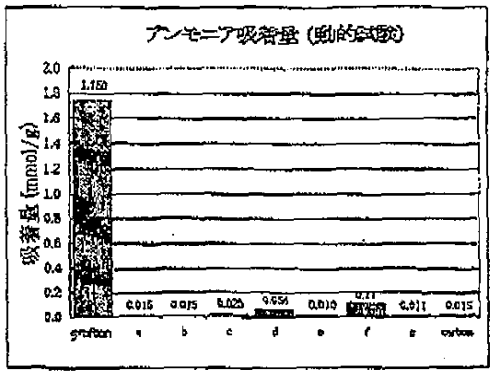


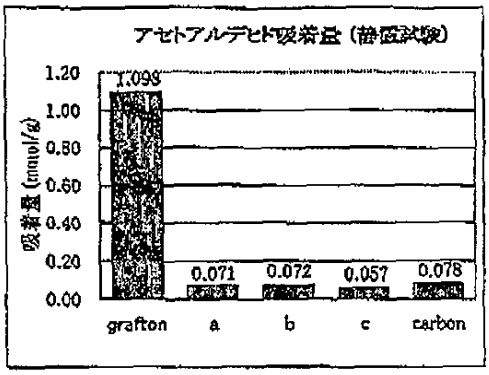
試験方法は 6p

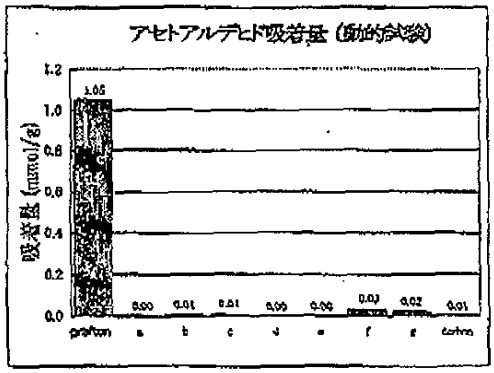
GRAFTON［グラフトン］吸着試験データ　吸着容量（単位重量あたり）

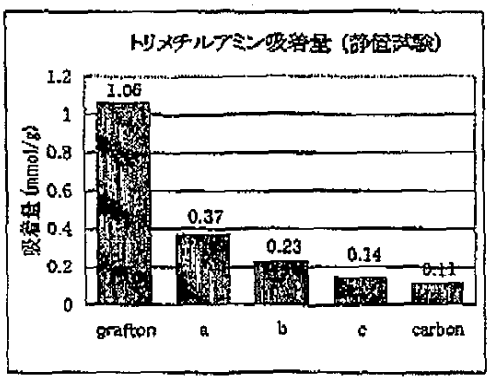
悪臭の代表的な成分である「アンモニア・トリメチルアミン・アセトアルデヒド」

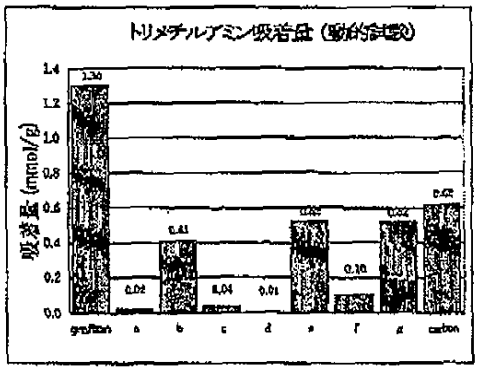






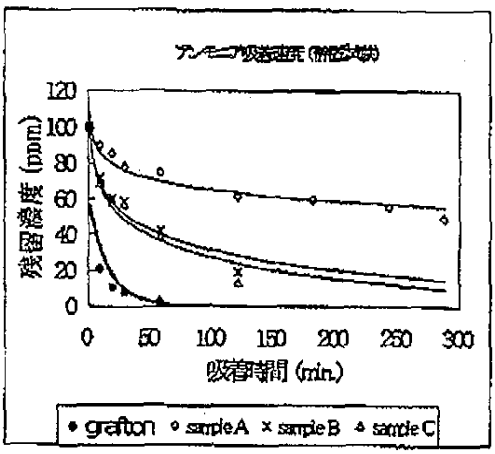


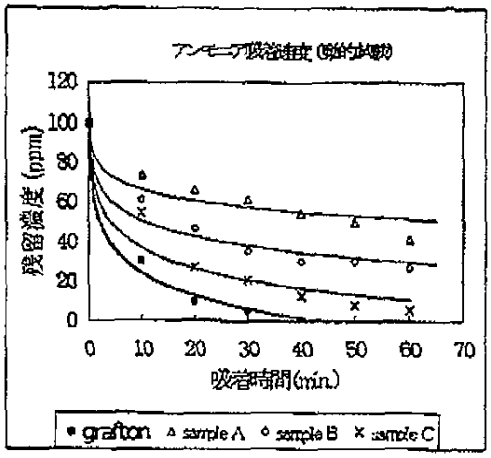


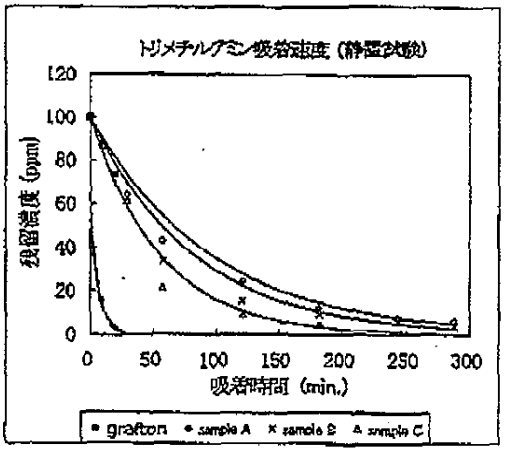


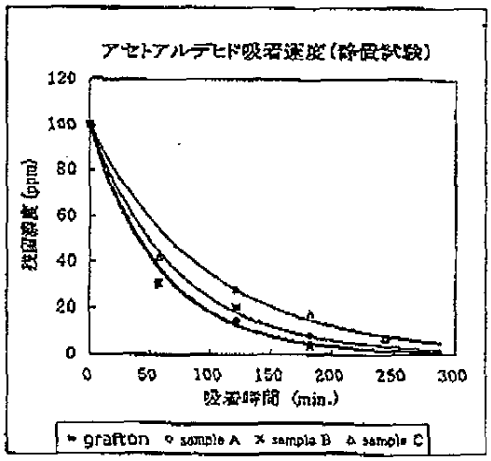
GRAFTON［グラフトン］ 吸着試験データ 吸着速度

悪臭の代表的な成分である「アンモニア・トリメチルアミン・アセトアルデヒド」









試験方法

ガス体、とくに悪臭に対する試験方法は未だ公的に規定されたものはない。したがって環境技術研究協会発行の環境技術別冊に掲載された東大工学部の測定方法に準拠して行った。

検体の重量は80g。動的試験の各社の製品はそのまま使用し、積算吸着容量は試料重量で換算した。

試験装置はアクリルで巾50cm、奥行50cm、高さ60cm、内容積0.15m³の直方体の透明な箱を作成し、中央部にサンプリング用のタップとガス注入用タップをつけ、底部には撹拌用の小さなファンを設置した。

積算吸着容量は、まず試験装置中に対象ガス体を注入し、100ppmの濃度になるよう調整した。吸着速度は経過時間ごとの濃度を測定した。吸着量は試験開始後 20ppm に減衰した時に再び 100ppm に調整し、以後これを繰り返し、5 時間経過後も 20ppm に減衰しない時点で試験を終了した。(すべて 20°C)

GRAFTON

Technical Description and Data

Bussan Grafton Co., Ltd.

GRAFTON is a worldwide-patented technique based on electron beam graft polymerization method. It is a technique for determining the chemical adsorption of an object under study on molecular level at low cost. Description will be given below on the technology of GRAFTON for successfully achieving electron beam graft polymerization at high performance and low cost, which had been attained in the past at high performance and high cost. Under cooperative research and study with Professor Masahiro Hori (*1) of Yokohama National University, this technique was presented and introduced at scientific and technical conferences as a technique for protection against undesirable effects of VOC (volatile organic components), sick house syndrome, etc. caused by the substances such as formaldehyde. The technique is now used in practical application.

What is GRAFTON?

Patent (*2)

The patent of GRAFTON covers the technique to perform

electron beam graft polymerization at low cost on two or more substances with different properties. The patent also covers the products produced by the technique.

Principle

A base material (such as cellulose, resin, etc.), which is a stable substance, is chemically bound with functional group (such as acidic group, amino group), to which the substance under study is adsorbed through high chemical reactivity. In practical application, the base material is temporarily activated under irradiation of electron beam. Then, the functional group is grafted in form of tentacular structure similar to tentacles of sea anemone.

(1) High adsorption rate

Direct contact area between the object under study and the functional group is larger, and adsorbing rate is high.

(2) Large capacity

The effective capacity per weight of the functional group is high. It is 150 times as high as that of NH_3 gas and activated carbon of the same weight.

(3) No reverse discharge

Because the technique is based on chemical reaction

type adsorption, no reverse discharge of the adsorbed substance occurs as seen in the case of physically adsorbed activated carbon.

(4) Long-sustaining effects

Long-sustaining effects can be attained because the functional group is not separated from the base material while maintaining the effects.

(5) High safety

High safety is assured because it is based on the reaction of macromolecular level. Wide selectivity in safe base material and functional group is assured.

(6) Extensive application

Various forms and shapes such as liquid, granular, sheet, gel, etc. can be chosen through the selection of the base material.

(7) High selectivity

Wide range of the substance such as basic gas, acidic gas, etc. is assured by strict selection of the functional group.

(8) Low cost

Graft-polymerized products of high performance and high cost can be produced through the production at high performance and low cost by the patented technique.

Comparison of molecular model structure

(In fact, it is developed 3-dimensionally.)

Comparison of the conventional chemical reaction with that of GRAFTON

Loss due to volatilization of functional group (adsorbent molecules) and adverse effects to human body

Conventional type	Performance	GRAFTON
×	Adsorbing rate Contact area	○
×	Total adsorbing quantity Effective quantity of functional group	○
×	Economic feasibility Adsorbing ability - Unit price	○
×	Sustained effects Substance stability	○
×	Harmfulness Molecular weight; diffusion	○

Surface area of functional group (adsorbent molecules) is small.

All functional groups (adsorbent molecules) are grafted, and no volatilization occurs. Opened to external world (Adsorption area is extensive.)

Comparison of the adsorption of GRAFTON to formaldehyde gas

Compared with the activated carbon of the same weight, GRAFTON has adsorbing capacity of about 75 times. (For comparison with our results, see the description below.) Physical adsorption type substances such as

activated carbon, zeolite, etc. are disadvantageous in that the molecules once adsorbed are discharged reversely from the causes such as temperature change. Also, there is no selectivity. Other gases, moisture, etc. are adsorbed, and the intended purpose is not attained. When a type of substance is used, which has liquid agent physically impregnated in the base material and is not based on graft polymerization, good adsorption data may be obtained in the closed space experiment such as desiccators because volatile components are not diffused. However, at an open place, the components are easily volatilized and diffused at earlier time. In such case, no reaction with the gas under study occurs, and no good effects can be obtained. It is reported that photocatalyst has no effect, and gas concentration after the reaction is increased (3*).

Major presentations and records of the study (excerpts)

1. 1993
   (presented at the conference of the Association for the Research of Environmental Studies)
   Performance of deodorant was evaluated by using pulp ball as base material. (The first public presentation)
2. 1994

Onward Kashiyama adopted this technique for deodorant suits. (High durability for dry cleaning)

3. 2000

(presented at the conference of the Association of Indoors Environmental Studies)

"An Evaluation of the Testing Method of Film Coating Materials for the Improvement of Indoor Environment"

Evaluation result was as high as 98% in the sealing test of formaldehyde (reported by Professor Masahiro Hori of Yokohama National University)

4. 2000

(presented at the conference of the Architectural Environment and Energy-Saving Organization)

RC structure actual-size experiment

Testing was performed on 38 types of gaseous substances

5. 2001

At the Housing Development Corporation, the technique was applied for the construction of the facilities for the aged people.

6. 2001

The technique was applied at the Technical Center of General Research Institute (Housing Development Corporation).

7. 2001

The technique was adopted as air filter in smoking compartment in the New Bullet Train system (Nozomi).

8. 2002

The study results on the technique were presented at the meetings of the Japan Air Cleaning Association and the Institute of Architecture.

9. 2002

The results of the study were reported as the cooperative study at the world conference of the Indoor Air Quality Association of the Environmental Protection Agency in U.S.

Chemical reaction formulae

1. Functional groups for reliably catching and for purifying and deodorizing formaldehyde (HCHO) and acetaldehyde are attached to pulp balls (regenerated cellulose) or to starch by chemical bonding. Through chemical reaction, formaldehyde or acetaldehyde is turned to aldehyde oxime and water. No reverse reaction occurs.

Chemical reaction formula:

$$R\text{-}SO_3HONH_2 + HCHO \rightarrow CH_3NO + H_2O$$

(R: base material)

2. It is a macromolecular sulfonic acid group ($-SO_3H$), i.e. a functional group having chemical structure for

catching and deodorizing basic offensive odor (represented by ammonia (NH_3). This is attached to pulp ball (regenerated cellulose) by chemical bonding at high density (1 - 2 mols per 1 kg of GRAFTON). Because harmful substances and offensive odor are adsorbed in accordance with the following reaction formula, harmful substance or offensive odor is not brought back even when the temperature in the room is increased as in the case where activated carbon is used.

Chemical reaction formula:

$$R\text{-}SO_3H + NH_3 \rightarrow R\text{-}SO_3NH_4$$

(R: base material)

3. GRAFTON purifies and deodorizes methylmercaptan (CH_3SH), hydrogen sulfide (H_2S), etc. Further, it is effective to deodorize various types of odor caused by organic compounds. As the base material, porous materials such as activated carbon are used, and metal complexes are attached by chemical bonding. Reactions represented by the formulae given below take place. Methylmercaptan, hydrogen sulfide, etc. are changed to other odorless substances and are not turned back to original state.

Catalyst: $R\text{-}2N(CH_3)_2CuSO_4$

$R\text{-}2N(CH_3)_2FeSO_4$

Chemical reaction formulae: $4CH_3SH + O_2 \rightarrow 2(CH_3)_2S + 2H_2O$

$$2H_2S + O_2 \rightarrow 2S + 2H_2O$$

(*1) Professor Masahiro Hori, Yokohama National University: Director of the Working Group on "the Method for Measuring Volatile Organic Compounds (VOC) in Indoor Air in Accordance with JIS" for the protection against sick house syndrome now in execution under the direction of the Ministry of Economy, Trade and Industry. Professor Hori is the author of a large number of study reports.

(*2) Japan Pat.2643823 Adsorptive materials and method for manufacturing the same

Euro Pat.0616845 Adsorptive materials process for producing them

U.S. Pat.5,506,188 Adsorptive materials process for producing them

(*3) A Study on Reduction of Chemical Substances by Using Photocatalyst (2)
Miyoshi and Hoshi: (Annual Report of Tokyo Metropolitan Research Institute of Environmental Technology 2000)

Major components

Base materials: Regenerated pulp, activated carbon, zeolite, starch reduction solution, rayon, nylon,

and polyester

Functional groups: Cation type macromolecular sulfonic acid group, macromolecular carboxylic acid group, amino acid, metal complex, etc. (Functional group can be changed to suit the intended purpose.)

Others: Reduced maltose, moisture, etc.

Procedure to use

Direct polymerization:

Electron beam is irradiated to the product itself such as original texture or resin, and direct graft polymerization is performed.

High functional group concentration can be attained. Effects will not be decreased even when the material is washed off.

Mixing:

The substance obtained by graft polymerization to other base material is mixed with the product.

The scope of application is extensive including textile, powder material, etc. The concentration of the functional group and the cost can be easily calculated.

Impregnation and coating:

The substance obtained by graft polymerization to

a water-soluble base material is impregnated or coated on the product. The technique can be easily incorporated in the existing production system at low cost.

Application examples

Automobile: Protection against VOC in automobile; for deodorizing

Solvent: Processing of residual monomer; processing of exhaust gas derived from production process

Textile: Functional texture; filtering

Filter: Processing of VOC, deodorizing, water liquid treatment

Coating material: Processing of functional coating material and residual monomer

Adhesive: Processing of functional adhesive and residual monomer

Additive: Processing of excessive substances derived from production process

Cosmetics: Functional cosmetics; moisture retention

Toiletry: Moisture retention; deodorizing

Chemicals: For adsorbing and removing harmful substances

Perishable refuse processor: Deodorizing (used as

additive to bacterial bed)

Items for pet animals: Pet odor adsorbent sheet, granules, or spray

Building materials and room interior items: Protection against sick house syndrome

Buildings and houses: Protection against sick house syndrome

Packaging and packing: Functional packaging and packing

General-purpose deodorant: Gel, spray, etc.

GRAFTON Formaldehyde adsorption test data

Testing method (3)

A 5-liter glass container was filled with 3.5 μl of HCHO by using microsyringe. It was left to stand for 30 minutes until equilibrium was reached. Residual concentration after the time elapsed was determined. When all substances were vaporized, the concentration was 457 ppm.

The specimens used were:

GRAFTON sheet ST, gel GRT, granular PT

(Comparative specimen: activated carbon)

Formaldehyde Adsorption Curve

(Static test)

Gel
Granule
Sheet
Activated carbon

Testing conditions
Case: 5-liter glass container
Gas: HCHO 3.5 μl
Specimen weight: 10 g
Testing method
The container was filled with gas.
It was left to stand for 30 minutes until equilibrium was reached. Then, the test was performed.
Air temperature: 20°C
Calculated concentration: 457 ppm

Concentration

(ppm) Time (min)

Total adsorbed volume of formaldehyde / 1 g
Activated carbon
Grafton

See the end of this paper for the testing procedure.

GRAFTON Adsorption test data

Adsorbed quantity (per unit weight)

Representative components with offensive odor:
Ammonia, trimethylamine, acetaldehyde

Ammonia adsorbed quantity (Static test)

Ammonia adsorbed quantity (Dynamic test)

Adsorbed quantity

Acetaldehyde adsorbed quantity (Static test)

Acetaldehyde adsorbed quantity (Dynamic test)

Trimethyl amine adsorbed quantity

(Static test)

Trimethyl amine adsorbed quantity

(Dynamic test)

GRAFTON adsorption test data

(Adsorbing rate)

Representative components with offensive odor:
Ammonia, trimethylamine, acetaldehyde

Ammonia adsorbing rate

(Static test)

Ammonia adsorbing rate

(Dynamic test)

Residual concentration

Adsorption time (min.)

Trimethylamine adsorbing rate

(Static test)

Trimethylamine adsorbing rate

(Dynamic test)

Testing procedure

No publicly authorized testing procedure to determine gas is available at present - in particular, for the gas with offensive odor. In this respect, the test was performed in accordance with the measurement method as

practiced in the Faculty of Engineering, Tokyo University as published in the Special Issue of "Environmental Technique" by the Association of Environmental Studies.

The weight of the specimen used for the test was 80 g. In the dynamic test, the products of the manufacturers were directly used without additional procedure. Integrated adsorbed quantity was converted to the weight of the specimen.

As the testing apparatus, a transparent box made of acryl resin, in parallelepiped shape (50 cm x 50 cm x 60 cm (W x D x H) with internal volume of 0.15 m^3, was prepared. At the center of the box, a tap for sampling and a tap for gas injection were provided. A small fan was installed at the bottom for the purpose of stirring.

To determine the integrated adsorbed quantity, the gas under study was injected into the testing apparatus to have a concentration of 100 ppm. To determine the adsorbing rate, the concentration was measured at the predetermined elapsed time. When the adsorbed quantity was reduced to 20 ppm after the initiation of the test, it was re-adjusted to 100 ppm. Thereafter, this cycle was repeated. When it was not attenuated to 20 ppm even after 5 hours, the test was terminated. (All tests were performed at 20°C.)